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Livestock and the environment in Sioux County

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Abstract: *Why don't livestock producers make the best use of their manure resources? How can they do a better job? Focus groups and a countywide survey in Iowa's Sioux County, a major livestock producing area, were used to answer this question.*

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Budget:
$29,545 for year one
$32,976 for year two

Background

More livestock are raised in Sioux County than in any other county in Iowa. The resulting large supply of manure has created problems related to proper manure management and the potential for water pollution. A survey and focus groups prior to the start of the project identified several barriers to the proper utilization of manure by livestock producers. A post-project survey demonstrated how the project had helped change the way manure is managed on many of the producers' farms.

These were the barriers identified by producers:

- Manure testing—knowing the nutrient content of the manure, its availability, and application losses,
- Calibration of manure spreaders—knowing that the proper amount of manure is being applied to meet crop needs, and
- Community relations—properly applying manure near other property owners without generating complaints about odor.

Manure testing—The project provided manure testing at a reduced price to area producers to encourage them to do more testing. One problem with testing is that manure samples normally are collected during the time when the manure is being applied to the land. It takes 7 to 10 days to analyze the samples, so most of the manure is already applied before the results are received. In addition, some producers felt that the liquid manure should be agitated prior to sampling. This requires the use of expensive probes that regular producers are unlikely to own.

Calibration of manure spreaders—Few manure spreaders are calibrated to determine the actual application rate because of the time and risk involved with calibration. To cope with the situation, a set of portable scales was purchased to calibrate manure spreaders in the field. The process was then completed quickly and conveniently without having to convey the manure to an elevator for weighing.

Community relations—Manure odor has been a concern for livestock producers and soil injection of manure has been proposed as a solution. Several producers had streaking across their fields from injected manure that was not spread properly. ISU Extension addressed these and other issues on community relations at its annual Manure Certification Program session.

Approach and methods

Two focus groups of 12 producers each discussed the level of understanding of manure issues in Sioux County. They concluded that Sioux County farmers were better managers of manure than were other farmers in Iowa.

A survey of county producers was used to determine their attitudes and understanding of

The key questions farmers asked in this project were: "How much of the N in manure will be available for the corn crop this year? Can I reduce my commercial fertilizer inputs? Can I manage my manure application within limits of what the law requires, and still not reduce corn yields?" Survey information and farmer discussions near the end of the project time period indicated that farmers did indeed learn how to better manage manure through manure testing, applicator calibration, and manure plot analysis. More farmers now believe in the nutrient content available in manure – which gives them the confidence to use it as a fertilizer source replacing commercial inputs, stay within the bounds of their nutrient management plan, and reduce water quality risks.

manure management questions. Results revealed that producers who tested manure were more likely to reduce the amount of commercial fertilizer they applied and were more satisfied with the effects on their crops. This suggested that manure testing would help improve manure management skills and that the new technology in swine industry feeding systems needed more research.

A manure plot demonstration was used to compare manure application to commercial fertilizer and to provide a forum to discuss the testing results. Side-by-side comparisons were an effective educational method.

The testing protocol used here collected two samples from manure storage two weeks prior to land application. One sample was collected from the surface, a second with a probe, and three more during application (first, middle, and last load).

Many producers cited proper manure calibration as an obstacle to optimal application of manure. There were several barriers to correctly calibrating manure wagons.

Results and discussion

Key manure sampling questions:

1) How consistent were different lab analyses?
Six sub-samples were taken from a larger sample and submitted to different laboratories for analysis. Nitrogen readings varied less than expected. K_2O (potash) varied minimally, but the phosphate variation was much wider. This suggests the need for caution in future phosphorus (P) management rulings. There were no significant differences among the lab readings, but it was clear that the test itself is more critical than the lab where it is processed.

2) What level of nutrients was found in the manure pits sampled?
Producers who know the nutrient content of their manure can better plan how to use it. Researchers conducted tests to determine nutrient concentration in various types of facilities. They sampled manure from 31 swine finishers using wet/dry feeders, 26 swine finishers using dry feeding systems, six swine nurseries, eight dairy pits from five different facilities, and four farrowing or farrowing/nursery manure pits. Data collected from these samples measured total nitrogen, ammonium phosphate, potash, and total solids. The sample results varied widely, which supported the distinct need for sampling of stored manure before application.

3) How accurate was a non-agitated sample taken before applying manure, in comparison to samples taken at the time of application?
Manure samples collected throughout the study indicated that the simple surface sample (using a pail to dip the sample) provided a statistically better prediction of the nitrogen and potassium than the more complicated profile sample. The profile sample was better at predicting phosphorus level.

4) If samples taken from a pit are stored, how does the nutrient test change over time?
Thirteen sub-samples were extracted from a larger manure pit sample from a swine finishing facility. One sample was checked that day as a baseline test. Four sub-samples were refrigerated, four were frozen, and four were kept at room temperature. One sample from each sub-group was sent for lab analysis on days 5, 6, 11, and 20. There was no significant difference among all of the samples, except that in most cases the room temperature sample seemed to show a drop in nutrient content by day 20. This procedure needs to be repeated before drawing any lasting conclusions or making firm recommendations to farmers.

Conclusions

This manure-testing project has helped alter ISU Extension recommendations for conducting such tests. Prior to this project, pre-testing was always done by using a probe or agitation and then collecting the sample. The statistical results of this study show that a sample dipped off the surface can efficiently predict the nitrogen value of that manure storage structure. This also was the first study to show that the type of feeder used in swine finishers has a major role in determining the nutrient content. Wet/dry feeders have a higher nutrient content than standard feeders because of the reduced water usage.

Calibrations were shown to be an important part of proper manure application. When the project provided equipment to weigh tank wagons in the field, producers were more likely to calibrate their spreaders. Producers assumed that the model number reflected the spreader capacity in gallons. But after more accurate measurements were taken, most producers found that the spreader's actual volume averaged only 85 percent of what they believed to be the capacity.

General conclusions of the project were:

1. Collecting a manure sample from the surface is an accurate way to predict nitrogen application during land application.
2. Probed manure sampling is needed if an accurate phosphorus level is to be determined.
3. Calibrations are required to accurately apply the proper manure rate.
4. Education has made a difference in improving manure management in Sioux County.

Impact of results

In a follow-up survey, 92 percent of the producers responding indicated that they are doing a better job of applying manure to their land than they were five years ago.

Kris Kohl, ISU Area Extension engineer, calibrating a liquid manure applicator to help detemine actual application rates.

ISU Extension has changed its manure application recommendations to Iowa farmers as a result of information obtained from this project. New facts about collecting samples and calibrating equipment have been added to the state's Manure Certification Program.

Education and outreach

Two field days were held to demonstrate the effects of manure nutrients on crops. A newsletter on the project results was sent to more than 1,000 farm operators.

Findings from the project have been used in educational presentations in northwest Iowa and elsewhere. Commercial and confinement manure application training (offered to more than 2,000 people annually) included recommendations on testing results and calibration obtained from this study.

Posters with information from the project were presented at the North Central branch meeting of the American Society of Agronomy and the American Society of Agricultural Engineers.

Sharing the data one-on-one with producers has been the key to convincing them about the value of manure as a nutrient for their crops. Survey results showing the responses of crops to proper nutrient use has encouraged more farmers to reduce manure application rates and pay closer attention to application rates.

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Mary Hettinga, project coordinator, collecting a core sample from a liquid manure storage facility.